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A FRUIT FLY Anastrepha grandis (Macquart)

Combinations

Tephritis grandis Macquart, 1846
Trypeta (Acrotoxa) grandis (Macquart) Loew, 1873

Selected
Synonyms

Anastrepha schineri Hendel, 1914
Anastrepha latifasciata Hering, 1935

Order: Family

Diptera: Tephritidae

Economic
Importance

A. grandis larval feeding usually destroys the pulp of cucurbit fruit, rendering them unfit for consumption. This species may potentially damage squash, pumpkin, and other cucurbits if it were to become established in the Southern States (Stone 1942). The immature fruits are apparently preferred, but mature or nearly mature fruits of some cultivars are infested on occasion (Oakley 1950).

Hosts

The primary hosts are cucurbits. It has been reported attacking Citrullus lanatus (watermelon), Cucumis melo, Cucumis sativus (cucumber) (Korytkowski G. and Ojeda Peña 1968), Cucurbita maxima (Boscán de Martínez et al. 1980), Cucurbita moschata (pumpkins, squashes) (Caraballo de Valdivieso 1981), Cucurbita pepo (pumpkin) (Korytkowski G. and Ojeda Peña 1968), and Lagenaria siceraria (white-flowered gourd, calabash gourd) (Caraballo de Valdivieso 1981).

General
Distribution

This species has been specifically reported from Argentina, Bolivia, Brazil, Colombia (Stone 1942), Ecuador (R. M. Hardman, pers. comm.), Panama, Paraguay (Stone 1942), Peru (Korytkowski G. and Ojeda Peña 1968), and Venezuela (Boscán de Martínez et al. 1980). Preliminary data from fruit cutting and McPhail trapping indicate the distribution in Brazil may be limited to the States south of Bahia (J. Fowler, pers. comm.).

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Contributor of diagnostic characters for adults.



Anastrepha grandis distribution map (Prepared by Technical Information Systems Staff, PPQ, APHIS, USDA).

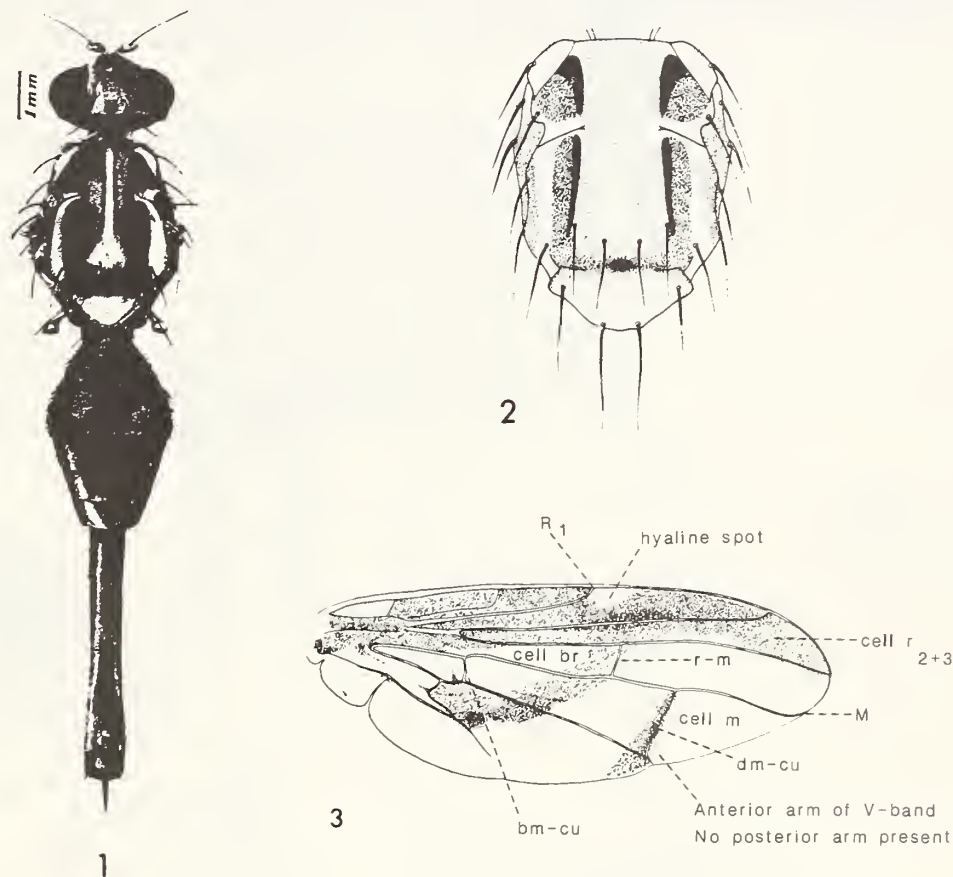
Characters

ADULTS (Fig. 1) - Male length 10-11 mm; female, 15-16 mm (Fischer 1932). Body yellow brown, marked with yellow and dark brown (Stone 1942). Frons darker anteriorly, longer than wide, maximum width about equal to one-third of head width; frontal setae in 3-4 pairs; orbital setae in 1-2 pairs (Fischer 1932).

Thorax (Fig. 2): mesonotum 3.3-4.0 mm long. Following areas yellow brown: postpronotal lobe (humerus), median scutal stripe widened to include acrostichal bristles but not reaching scutellum, lateral scutal stripes from just before transverse suture to side of scutellum, stripe below notopleuron, metapleuron, and scutellum except extreme base. Following areas dark brown: sublateral stripe from level of postpronotal bristle to scutellum, broken at transverse suture, band along scutoscutellar suture, intensified medially, spot on anepimeron (pteropleuron), and lateral part of mediotergite (metanotum). Macrochaetae dark brown, pile yellowish brown. Katepisternal bristle absent (Stone 1942). Legs dull yellow, distal half of anterior femur with 4-6 erect setae, posterior femur near apex

on dorsal surface with some small setae (Fischer 1932). Wing (Fig. 3) 9.0-10.5 mm long; bands yellow brown, rather diffuse; costal and S bands broadly connected; no distinct hyaline spot anterior to vein R4+5; distal arm of V band absent, proximal arm not joining S band (Stone 1942).

(Figs. 1-3)



Anastrepha grandis adults. 1. Female, dorsal view (From Fischer 1932. 2. Thorax, dorsal view. 3. Wing, dorsal view (From Korytkowski G. and Ojeda Pena 1968).

Abdomen underside lighter, yellowish, tergites 2-4 darker. Pubescence short, golden yellow. Tergite 5 almost as long as tergites 3 to 4, posterior border with corona of setae, posterior angles largely rounded (Fischer 1932).

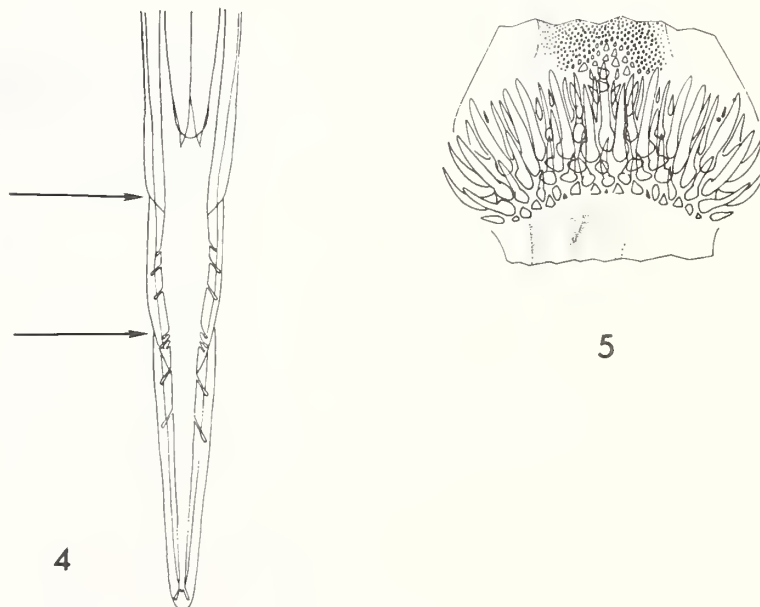
Female terminalia: segment 7 (ovipositor sheath) 5.8-6.2 mm long (Fig. 4), tapered posteriorly to distinctly broadened apical third, profile distinctly concave dorsally on median half and ventrally on apical third. Conjunctiva of segment 7

with 5-6 rows of well-developed, slender, strongly sclerotized dorsobasal scales (rasper) (Fig. 5). Aculeus (ovipositor) slightly longer than segment 7; tip long, slender, nonserrate; extreme base slightly widened (Stone 1942).

Male terminalia: tergal ratio about 0.95; surstylus (clasper) about 0.35 mm long, stout, portion distad of prensisetae slightly flattened, curved inward, apex blunt; prensisetae slightly distad of middle (Stone 1942).

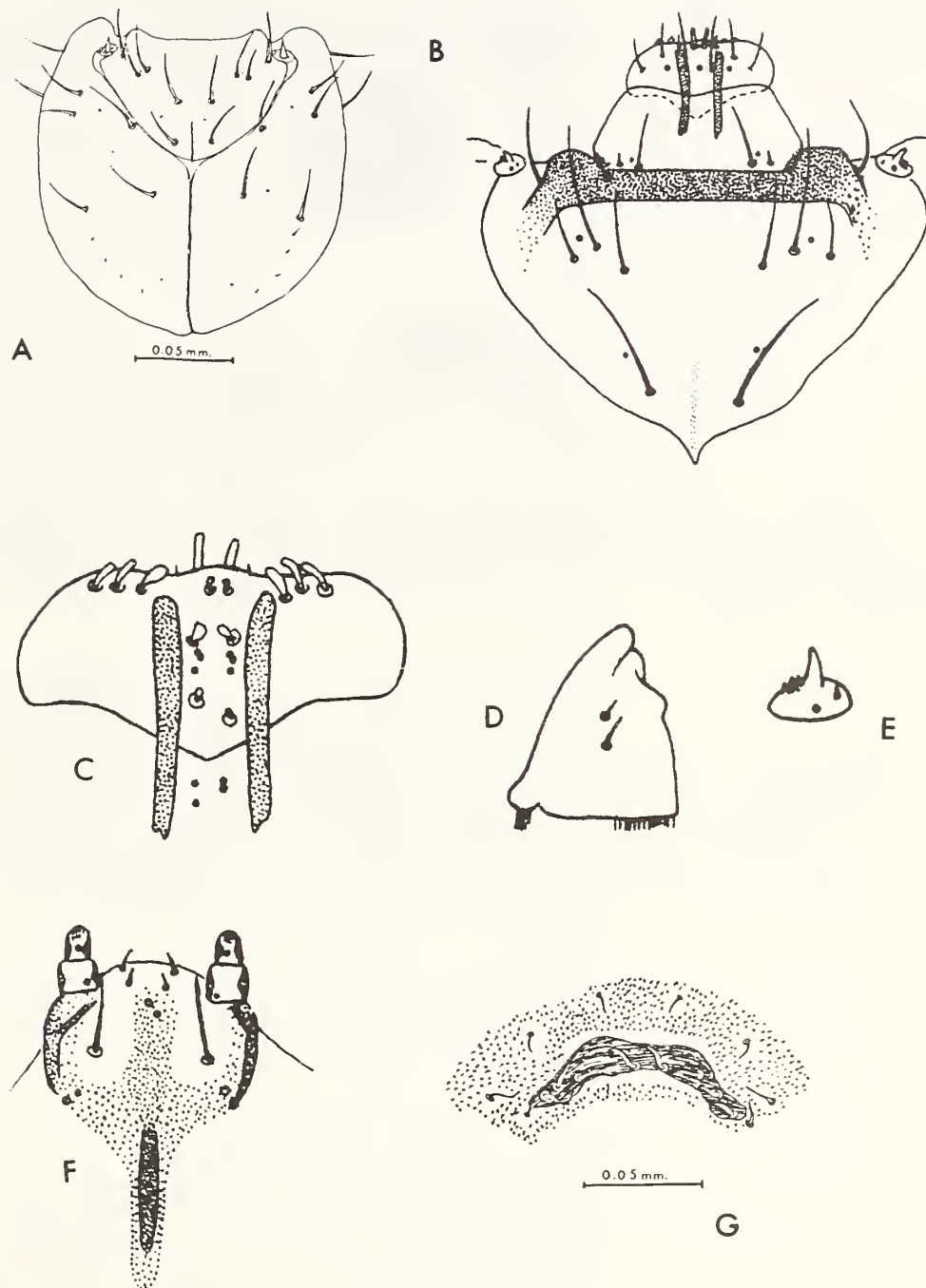
Diagnostic Characters - A. grandis can be recognized as an Anastrepha by the apical forward curve of vein M, which meets the costa without a distinct angle (Fig. 3). This species can be distinguished from most other Anastrepha by several characters. On the wing, the hyaline spot at the apex of R1 is small and diffuse or absent [In most other Anastrepha, a distinct hyaline spot extends at least to vein R2+3 (usually to R4+5, or continuous with hyaline area in cell br).]. Only anterior arm of V-band is present (covering dm-cu); posterior arm is absent (no oblique band extends toward apical part of cell m from anterior end of V-band). Thorax has some brown

(Figs. 4-5)



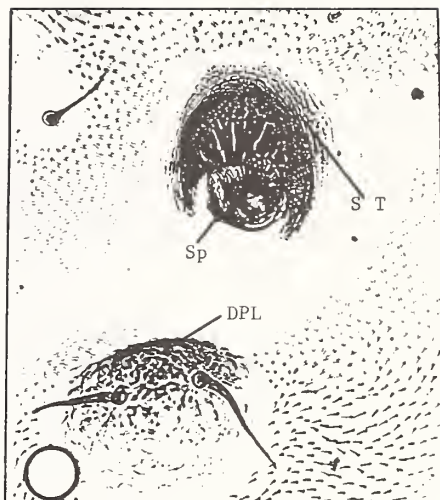
Anastrepha grandis female terminalia. 4. Aculeus (ovipositor) tip. Arrows indicate steplike ridges. 5. Dorsobasal scales of conjunctiva 7 (rasper) (From Korytkowski G. and Ojeda Peña 1968).

(Fig. 2)



Dendroctonus micans larval structures. A. Head capsule, dorsal view; B. Frontal area, clypeus, and labrum, 49 X; C. Epipharynx, 150 X; D. Mandible, dorsal view, 150 X; E. Antenna, 150 X; F. Labium, ventral view, 150 X; G. Tergum of 9th abdominal segment, showing pigmented sclerite (A, G from Thomas 1965; B-F from Lekander 1968).

(Fig. 3)

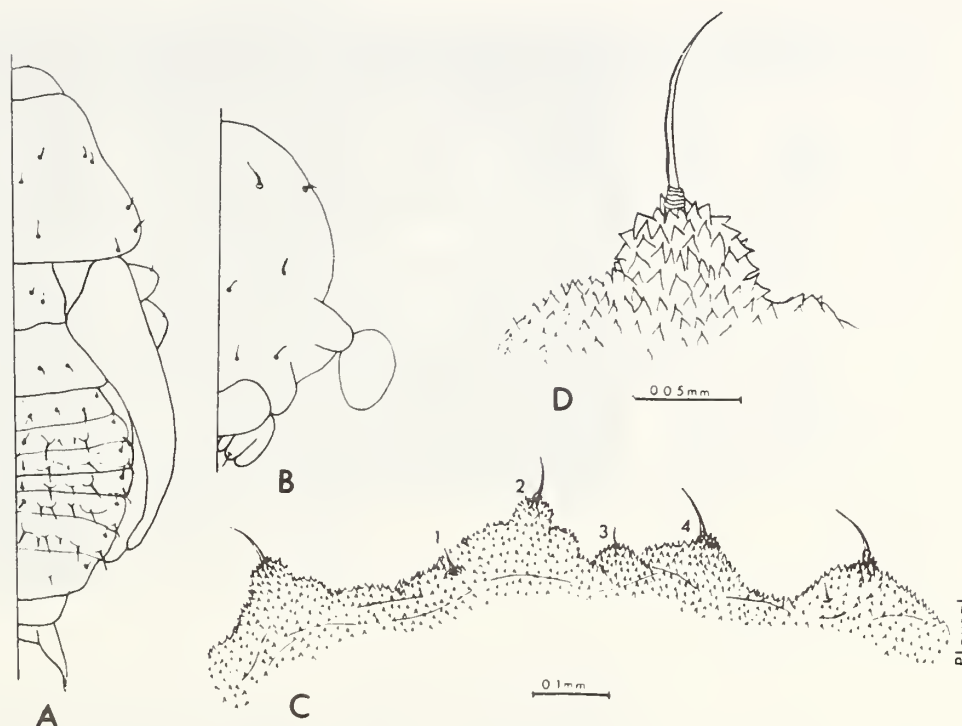


Dendroctonus micans pleural area of larval abdominal segment, showing spiracular tubercle (S T), spiracle (Sp), and dorsopleural lobe (DPL) (From Thomas 1965).

LARVAL COMPARISON - Larvae of D. micans can be separated from those of most North American Dendroctonus species by use of the keys by Thomas (1957 for genus, 1965 for species). However, Thomas' key to Dendroctonus species does not include D. punctatus, because the larva of that species is undescribed. The key by Lekander (1968) will separate larvae of D. micans from those of most of the Scolytidae of northern Europe. The most distinctive feature of larvae of this species is the pigmented sclerite (Fig. 2G) on the 9th (terminal) abdominal segment (Thomas 1965). All other known Dendroctonus larvae either have sclerites on the 8th and 9th abdominal terga or no sclerites on either of those areas (Thomas 1965). Slide mounts of dissected larvae will be necessary to examine the smaller structures figured.

PUPAE - Maximum length about 8.0 mm. White when newly formed; body form as in Figs. 4A-B. Head with 6 pairs of short setae, distributed as in Fig. 4B. Prothorax with 8 pairs of setae (Fig. 4A), which do not arise from tubercles. Meso- and metathorax each with 2 pairs of dorsal setae (Fig. 4A). Femur of each leg with single subapical seta. Elytra smooth, without setae or granules. Abdominal segments 3-6 all bear tubercles 1 median, 4 dorsolateral, and 1 pleural (Fig. 4C), all spiculate and bearing a seta (Fig. 4C); largest setae wrinkled at bases (Fig. 4D). Terminal (9th) abdominal segment with pair of prominent, posteriorly projecting pleural spines (Fig. 4A). Functional, circular spiracles below pleural tubercles on abdominal segments 1-6.

(Fig. 4)



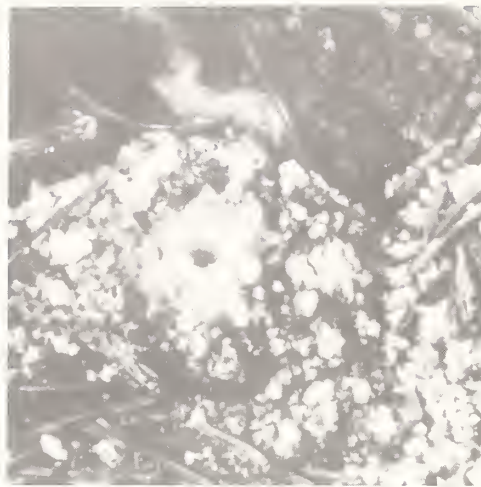
Dendroctonus micans pupa. A. Entire pupa, dorsal view. B. Head, front view. C. Tubercles and setae on one-half of abdominal segment 6, left to right: median tubercle, 4 dorsolateral tubercles (numbered), and pleural tubercle. D. Medial tubercle and seta (which is wrinkled at base) on abdominal segment 6 (From Thomas 1965).

PUPAL COMPARISON - Pupae of this species can be separated from those of most North American Dendroctonus species through use of the key by Thomas (1965). However, a comparison with the pupa of D. punctatus is not possible, because the pupal stage of the latter species is undescribed. The most distinctive feature by which the pupa of D. micans can be distinguished from those of the other species studied by Thomas (1965) is that none or very few of the setae of the head and prothorax arise from tubercles in D. micans, but are subtended by tubercles in the North American species.

Characteristic Damage

At a distance, the streams of white, dried resin flows on the trunk are very characteristic. A tree suffering repeated attack (Figs. 5 and 6) is encrusted with resin; resin tubes; broken and peeling, often blackened bark; and frass (Bevan and King 1983).

(Figs. 5-6)



5



6

Dendroctonus micans. 5. A large blob of resin at entrance site and frass. 6. Trunk showing typical signs of brood activity (From Bevan and King 1983).

Detection
Notes

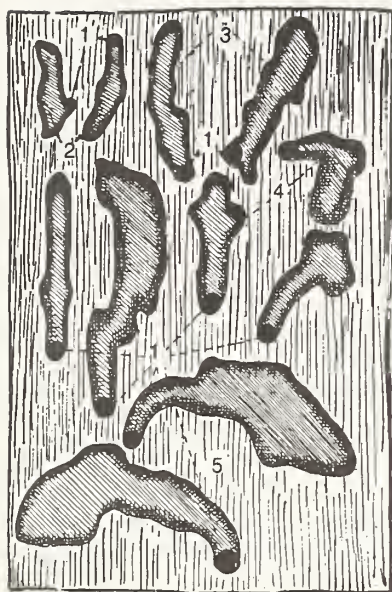
This species may move between countries in the bark-wood interface, most probably with logs or rough lumber from which the bark has not been removed. Resin tubes and frass will probably have been removed from the bark surface in transit, so the absence is not a reliable indicator of absence of the pest. All D. micans stages occur between bark and wood. Without bark-wood interface, the pest cannot survive. Wood products entering the United States are subject to inspection under various regulations, mainly Title 7, Part 330.105, of the Code of Federal Regulations. No specimens identified as D. micans have been intercepted by PPQ in the past 10 years.

This species can be detected in the following ways.

1. Scan trees for resin tubes and frass on the bark.
2. Look under the bark for adults, larvae, and pupae on the lower part of the trunk, on the root-collar, and the root pads.
3. Look under the bark of the trees for egg galleries and larval chambers (Fig. 7).

For identification, submit suspect adult specimens, pinned and labeled. Preserve larvae and pupae in alcohol.

(Fig. 7)



A



B

Dendroctonus micans. A. Egg galleries, basal sections. 1. Entrance burrow. 2. Excavated July 8-16. 3. Excavated July 8-29. 4. Eight days old. 5. Three weeks old. B. Advanced egg gallery and larval chamber (T = entrance tunnel; L = larvae) (A from Hopkins 1909b; B from Chararas 1962).

Biology

In Siberia, D. micans develops in 2 years. Adults and larvae overwinter (Kolomiets 1981). Larvae and adults near the root collar and underneath the root bark survived air temperatures down to -52°C . Adults inhabit the lower part of the trunk, the root-collar, and the root pads, burrowing along the roots in the soil down to 40 cm, but usually to a depth of 18-20 cm. Colonies on root pads are located as much as 22-25 cm from the trunk base. Sometimes, with surface root development, colonies may move as much as 1 m from the trunk (Kolomiets and Bogdanova 1978). Egg galleries (Fig. 7A) are vertical, frequently curved, and somewhat irregular, about 12-20 cm long in the bark (Hopkins 1909b). The female deposits about 250 eggs (Brown and Bevan 1966) in groups of 30-50 (Hopkins 1909b) against the wall of the cavity, about 2 cm in diameter, with frass and fine chips (Fig. 8). She continues feeding and egg laying through summer. Eggs hatch in about a month (Brown and Bevan 1966).

In a study of different Picea species in Belgium, larvae gnaw their way side by side in the phloem, forming feeding fronts of sometimes more than 50 individuals (Fig. 7B). Defecation and

molting occur at the rear, where frass is tightly packed. Afterwards, larvae return to the feeding front. Often, one or more rows of larvae wait for the opportunity to push through to the feeding line. This aggregative behavior begins at the earliest moments of larval life. The first individuals to hatch start a mine from the egg gallery; others join them. At pupation, each larva isolates itself in a niche in the frass (Gregoire et al. 1984). The new adult has its first meal within the brood chamber, then emerges and moves to a fresh position before breeding (Brown and Bevan 1966). New adults may infest the same tree or other trees within the same or distant forests. Flight threshold is 23 °C (Evans 1985).

In Siberia, eggs are present from mid-June to mid-July, larvae from early July to mid-August of the following year, pupae from late June to September of the second year, and adults of this generation from early July of the second year through the winter to the end of June of the third year. Females oviposit the last 10 days of June to July of the third year (Kolomiets and Bogdanova 1978).

Natural Enemies

The predaceous beetle, Rhizophagus grandis Gyllenhal (Coleoptera, Rhizophagidae) is one of the most important stabilizing factors for the D. micans population where the pest has been established for a long time. In the Massif Central (France), the female predator lays about 100 eggs in the laboratory. Adults and larvae feed on D. micans. To complete development, one predator larva requires the equivalent of one fully grown prey larva (Fig. 9) (Grégoire et al. 1985).

(Figs. 8-9)



8



9

8. Bark removed to expose Dendroctonus micans female with eggs.
9. Rhizophagus grandis larval group feeding on single Dendroctonus larva (From Evans 1985).

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